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ABSTRACT

Case-based learning is one method that can be used to foster critical thinking and schema construction. Students need to be provided with problem solving lessons in meaningful learning contexts for critical thinking to take place. In order for schema construction to occur, a framework needs to be provided that helps readers to elaborate upon new facts and ideas and to clarify their significance or relevance. A 6-week interdisciplinary project with ninth-grade students enrolled in Gallatin High School (Tennessee), located in a rural community where industry and agriculture are primary sources of revenue, was implemented. Cases were developed to help students reason about multiple major concepts expressed in Harper Lee's "To Kill a Mockingbird" and to help students apply these concepts to other contexts and subject areas. Each case was unique because different reading, research, and writing skills were needed to problem solve and complete the tack of the particular case. The teacher and her students became active participants in the learning process by creating an environment that was mutually adaptable rather than arbitrary and teacher dominated. Case-based instruction and learning provides students with a forum for taking an active role in structuring and creating their own meaning. (Fifty-five references and the flyer soliciting material for the cases are attached.)
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CASE-BASED INSTRUCTION AND LEARNING: AN INTERDISCIPLINARY PROJECT

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Case-Based Instruction and Learning:

An Interdisciplinary Project

Secondary teachers are becoming aware of the need for students to learn facts and ideas in a more relevant and meaningful context than through rote memorization. This entails achieving meaning through social interactions between the teacher and the learner that stresses resolving misconceptions through negotiation (Gowin, 1987; McDermott, 1977; Novak & Gowin, 1984). McDermott (1977) refers to these shared experiences as "trusting relations" that are necessary to achieve learning. It also involves incorporating knowledge from other subject areas as it relates to an area of study as well as establishing cooperative relationships among other faculty within the school and members of the community (Alvarez, 1981, 1989).

Too often content teachers treat their subject areas as discrete and separate entities with minimal efforts directed toward incorporating subject matter from other related disciplines into their teaching. In such instances, many students find information presented in a way that is artificial and not meaningful. Learning experiences are artificial because the information that is presented lacks a situational context for students to link new ideas to existing knowledge. This type of school experience that emphasizes facts and ideas in a manner that is rarely related to the students' life and community (Donham, 1949), tends to be learned as compartmentalized units to be later accessed in a specific subject area by way of either question answering or examination (Potts, St. John, & Kirson,

1989). This results in students mistakenly believing that success in school is equated with "knowing" a given body of knowledge of a subject rather than "learning" how this new knowledge can be related to their experiences and other subject disciplines both in-and-out-of-school.

The focus of this article is to examine how instruction that encourages critical thinking about what one has read can lead to incorporated knowledge that can be retrieved and applied to other related settings. Incorporation of ideas is achieved by assembling different knowledge sources in memory (see Spiro, Vispoel, Schmitz, Samarapungavan, & Boerger, 1987). In order for knowledge assembly and incorporation to occur, the role of knowledge activation and how one modifies or constructs schema with new information is an important consideration (Alvarez & Risko, 1989). In contrast, students have learned to concentrate on those facts and themes which they believe will be tested by the teacher in a given subject instead of reflecting on how these facts and ideas can be assembled, related to prior knowledge, and linked to other disciplines containing common conceptual networks.

Knowledge Activation and Schema Construction

Prereading strategies have been developed to help students relate new information appearing in written discourse to their existing knowledge. The design of many of these preorganizers reflects Ausubel's (1959) definition of readiness and the purpose

of their use is to create a mind set prior to reading. These preorganizers have included advance organizers (Ausubel, 1960, 1968; Mayer, 1987), structured overviews or graphic organizers (Alvermann, 1981; Earle & Barron, 1973), previews (Graves, Cook, & Laberge, 1983), concept maps (Novak & Gowin, 1984), and thematic organizers (Alvarez, 1980, 1983; Alvarez & Risko, 1989a; Risko & Alvarez, 1986). Yet, there is much evidence that good and poor readers do not use schemata appropriately or are unaware of whether the information they are reading is consistent with their existing knowledge (e.g., Bartlett, 1932; Bransford, 1979, Whitehead, 1929).

While schema theory explains how prior knowledge with a topic can be activated, it does not explain how schema is constructed. As Bransford (1985) points out, schema activation and schema construction are two different problems. While it is possible to activate existing schemata with a given topic, it does not necessarily follow that a learner can use this activated knowledge to develop new knowledge and skills. Students are often subjected to information that is course specific by which facts and ideas are given to them in the form of lectures and handouts with little emphasis on how they perceive its use in other subject areas. They take this material and try to make sense of it. But if this new information cannot be related to prior knowledge or experience their efforts are directed to memorizing and compartmentalizing this information.

Learning novel concepts requires the learner to connect new information to a congruent mental model. Mental models represent a person's construal of existing knowledge and/or of new information even though this information may be fragmentary, inaccurate, or inconsistent (Gentner & Gentner, 1983). A person's mental model is a representation of a particular belief based on existing knowledge of a physical system or a semantic representation depicted in a text. Holt (1969, 1989) states that it changes when we explore the world around us, and create knowledge out of our own questions, thoughts, and experiences. In essence, a mental model is comprised of our organization of world knowledge and experience and represents our structure of reality. Problem solving lessons and activities can provide learners with situations that aid in schema construction which includes critical thinking.

Critical thinking theory provides an explanation for activating existing schemata and for constructing new ones (Norris & Phillips, 1987; see Siegel, 1988). Critical thinking provides the learner with a strategy (see Siegler & Jenkins, 1989) for achieving understanding, and can be accomplished by contrasting ideas and engaging in reflective thinking (Dewey, 1933). A reader can either weigh alternative interpretations, dismiss others, make a decision to evaluate multiple possibilities, or accept information as being reasonable. This process helps learners to modify or extend their mental model, or existing knowledge base, for target concepts.

Case-Based Learning

Case-based learning is one method that can be used to foster critical thinking and schema construction. Learning through cases has long been an instructional method used with graduate business, law, and medical students. Such instruction is predicated upon mutual respect for ideas brought about through communication and negotiation of ideas between and among the teacher and students (Christensen, 1987; Dewing, 1931; Gragg, 1954; Lawrence, 1953; Towl, 1969). The case method of teaching and learning provides a forum during which students can develop their own framework to reason and think about problems and situations related to an area of study (Hunt, 1951). Cases that revolve around defined topics and that allow for multidisciplinary study can lead to better comprehension and knowledge transfer -- the application of preexisting knowledge to new situations (Spiro, et. al., 1987).

Cases that present learners with single and varied contexts across disciplines provide learners with scenarios that can be discussed and analyzed from multiple perspectives (e.g., see Christensen, 1987; Eldridge, 1990; Hunt, 1951; Spiro, et. al, 1987). These cases can include written documents, recorded (musical as well as narrative) interludes, paintings, artifacts, video portrayals, and other pertinent substances and materials.

A case is a connecting link between the teacher's conceptual scheme and the educative event. In an educative event, the teacher initiates the event with meaningful materials that are

guides to the event in which the students take part (Gowin, 1987). Cases are designed to stimulate class discussion. The case is not only a means for instruction, but also a method for sharing and negotiating meaning. A primary purpose of cases is to relate educative events to "real-life" situations both in-and-out-of-school. The case-based method of instruction is interdisciplinary in nature in that it contains problem situations that arise from a thematic concept that includes other subject areas. Cases contain authentic problems, genuine questions, and raise issues in enough detail for learners to suggest possible solutions or outcomes.

The Gallatin High School Interdisciplinary Project

Gallatin High School is located in a rural community where industry and agriculture (i.e., dairy and tobacco farming) are primary sources of revenue. A needs assessment conducted by the principal and faculty of this high school identified a recommendation to improve students' critical thinking and writing skills. An overview of case-based instruction and observations relevant to this initial six-week interdisciplinary project with ninth-grade students are reported to describe how case-based instruction can be implemented and used to foster knowledge activation and schema construction.[1]

The context of the literature unit, To Kill A Mockingbird (Lee, 1960). served as the anchor upon which the cases were written. A flyer was devised by the English teachers and

librarians and circulated to faculty members and to the local newspaper that invited items to be included as part of the case information (see Appendix). After receiving a variety of items, students sorted these materials according to style and format: journalistic-historical narratives, documents, research data, interpretive essay, oral statements, story, vignette, and text (see Newmann & Oliver, 1967). Students added four additional categories: oral history (video tapes of invited speakers from the community), visuals and illustrations, propaganda, and recordings.

Cases were developed to help students reason about multiple major concepts expressed in the novel and to help students apply these concepts to other contexts and subject areas. Each case (a) identified a major text concept (e.g., a jury of peers) which was examined within the context of the narrative, and (b) contained a problem situation that required students to analyze this concept according to a different perspective or within a different situation (e.g., the analysis of a peer jury's verdict in a more recent court case to decide whether the verdict compromised the role and function of the court). Each case required students to apply information to authentic problem situations that required students to think critically for obtaining a plausible and defensible resolution.

The cases used in this project differ from whole class deliberations that involve a discussion of the same concept by all class members. Instead, students individually selected one

case from an array of cases that appealed to their interest. Each case was unique because different reading, research, and writing skills were needed to problem solve and complete the task of the particular case. For example, some cases asked students to keep a written journal of their thoughts in working out the case problem, list sources consulted and materials referenced, make hierarchical concept maps as their case progressed, and then write a report containing illustrations, maps, mathematical principles and examples to support their position. Other cases required students to present a portion of their findings in a videotape. This required them to write and act out the script for the videotape that they produced and edited. These cases allowed students to bridge the gap of the happenings in the 1930s by comparing and contrasting these events to the present. All students were required to write a final report of their findings. Students' performance was evaluated on their ability to analyze various positions, take a stance and to justify it rationally.

Students engaged in group and class discussions as they studied their respective cases. For example, students who had selected the same case formed groups, consulted with each other as they gathered information, and discussed their approaches and resources. Class discussions of the novel gave students the opportunity to share what they were investigating as they pertained to the structural elements (i.e., setting, plot, characters, theme) of the novel. These discussions raised questions that encouraged students to seek additional information

in reaching a resolution to their case of inquiry.

Faculty members from other subject areas served as resource persons for these students in this interdisciplinary project as they investigated their cases. Some teachers included the historical context and themes of the novel into their subject area. For example, the art teacher discussed the artists and their paintings of the 1930s. From these discussions, the geometry teacher was asked to use a painting of Picasso, Guernica (1937), from which she made photocopies for her ninth-grade students and devised mathematical problems that could be discerned from the painting. The librarians played a crucial role in this undertaking by teaching library/research skills, gathering research materials, coordinating interdisciplinary studies (e.g., communicating with all teachers concerning materials available, working with interested teachers concerning interdisciplinary units), and archiving materials (videotapes were made of teachers and students collaborating with these cases using concept maps, thematic organizers, etc., oral histories of invited community members who gave testimony of the conditions of the community during the 1930s, artifacts--paintings, letters, pictures, and so forth of this historical period). These archives were housed in a special collection of the library holdings for faculty, students and interested personnel to review.

This interdisciplinary project focused on cases that engaged students more directly in their learning and provided a forum for

them to take an active role in structuring their own meaning. Self-selected cases served to activate and expand their knowledge through the use of thematically-organized and cross-disciplinary cases and facilitated students' ability to generate explanations for new information that were plausible and meaningful. In working through these cases, students were given opportunities to demonstrate the variety of abilities and interests they possessed by revealing in-school as well as out-of-school knowledge. Students were most articulate when they were confronted with meaningful tasks that required thinking and active participation in situations that: (a) incorporated knowledge from other disciplines and contexts, (b) were relevant to the experiences of their community; and, (c) allowed them to formulate and pursue their own interests to the related topics; thereby, allowing them to create their own learning contexts.

The teacher and her students became active participants in the learning process by creating an environment that was mutually adaptable rather than arbitrary and teacher dominated. Genuine questions were raised without preconceived answers. These kinds of questions were asked by both the teacher and students not to test, but to get information or clarify ambiguities. Concepts identified in the novel were used to construct questions about pertinent ideas with other related contexts that included their personal life and community. Self-selected cases allowed students to proceed on their own individual path and reduced their chances to fail. During this six week project, time was

not imposed by fractured units (all students on a given page, completing the same exercises), but on personal time schedules driven by curiosity and interest.

Equally important was that teachers began and ended this interdisciplinary project with invested interest and ownership. Teachers evaluated the instructional techniques and methods in relation to student academic performance. An empirical data base was established and the analyses were related to the needs assessment of the school.

Conclusion

If we expect critical thinking to take place, we need to provide students with problem solving lessons in meaningful learning contexts. Meaningful in the sense that new information is linked to existing concepts and, when learned, becomes incorporated (integrated and related to other knowledge sources in memory) rather than compartmentalized (isolated due to rote memorization). This notion is consistent with Ausubel's (1968) theory of learning, Gowin's (1987) theory of educating, and Gragg's (1954) warning that "wisdom can't be told."

In order for schema construction to occur, a framework needs to be provided that helps readers to elaborate upon new facts and ideas and to clarify their significance or relevance. Students need to learn more about themselves as learners. Notable in this learning context is the relationship between facts and ideas learned in formal school settings and those

encountered in everyday learning environments.

As educators, we need to provide the spark that ignites students and invites them to seek and create new knowledge. In order for us to do so, we need to make new learning meaningful. We need to give students time to digest facts and ideas, to be reflective and imaginative thinkers, and to provide opportunities for them to relate this new knowledge to their experiences and other disciplines. By so doing, students can be taught to become self-empowered (a notion that one can cause his or her own learning while trusting others in the process) in the learning process.

In conclusion, authentic cases seem to spur curiosity and invite students to initiate critical thinking. Case-based instruction and learning provides students with a forum by which to take an active role in structuring and creating their own meaning.

NOTE

1. A study that investigated the effects of case-based instruction, compared to traditional instruction, that focused on "average" ninth-grade students in this project and their ability to assemble and incorporate different knowledge sources in memory is reported by M.C. Alvarez in a paper titled "Knowledge Activation and Schema Construction," presented at the American Educational Research Association, Boston, 1990, ERIC Document ED 317 988.

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The authors recognize Paula Wakefield for her contributions to this project, and the other administrative and faculty members of GHS for their cooperation and participation.

Appendix

Appendix. Flyer requesting items for the project.

Attention History Buffs

Gallatin Senior High School is compiling a case of information on the decade of the 1930's to be used in the classroom. Any of the items listed, plus new ideas for interesting items are welcome. If you are interested in donating or loaning any memoralbia, or in giving your time as a speaker, please contact Judy Bivens or Cynthia Poole in the library.

1. **Music**--vocal, instrumental, dances, famous artists of the age, speakeasies, recordings, appropriate movies.

2. **Architecture**--styles, buildings in Gallatin still standing that were built 1929-1939, photographs of buildings of the era, etc.

3. **History**--world affairs, state government, local events, politics, major happenings.

4. **Photographs**--1929-1939.

5. **Artifacts**--clothing, tools, radios, phonographs, letters, etc.

6. **Publications**--newspapers, magazines, advertising.

7. **Art**--information about major movements, artists, examples of period pieces, photographs of works, impact of the Depression on the art world.

8. **Automobiles**--photographs of cars of the 30's, restored examples, information about production, state of technology, etc.

9. **Colloqualisms**--expressions common to the age(things your mama and grandma used to say that your children think are "out of it".

10. **Politics**--world, Tennessee, local

11. **Technological advances**--what was happening in science, the space program, what was invented, improved, changed, what "modern" conveniences were available?

12. **Entertainment**--radio, fairs, films, cartoons, books, dolls, toys, etc.

13. **Transportation**--what were the major forms?, how can these be compared to current forms?, pictures of trains, ticket stubs, etc.

14. **Sports**--what did our country play? who were the stars? what was the prevailing attitude toward sports? photos of anything, examples of equipment, baseball cards, etc.

15. **Fashions**--what did we wear? (photos especially helpful), magazines from the period that portray fashions, examples, etc.

16. **Military Paraphenalia**--any examples from the time, war stories of local interest, photos, etc.

17. **Famous persons**--who was well known? Ex. Bonnie and Clyde/Shirley Temple